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09/085,298	05/27/1998	RICHARD TODD GOLDBERG	TI-25588	6700

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EXAMINER

DUONG, KHANH B

ART UNIT	PAPER NUMBER
2822	

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Paper No. 14

Application Number: 09/085,298

Filing Date: May 27, 1998

Appellant(s): GOLDBERG, RICHARD TODD

Rodney M. Anderson  
For Appellant

**EXAMINER'S ANSWER**

MAILED  
JAN 29 2002  
GROUP 2800

This is in response to the appeal brief filed June 18, 2001.

**(1) Real Party in Interest**

A statement identifying the real party in interest is contained in the brief.

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**(2) Related Appeals and Interferences**

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

**(3) Status of Claims**

The statement of the status of the claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Invention**

The summary of invention contained in the brief is correct.

**(6) Issues**

The appellant's statement of the issues in the brief is correct.

**(7) Grouping of Claims**

The rejection of claims 1-5, 7-10 and 13 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

**(8) ClaimsAppealed**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(9) Prior Art of Record**

4,298,629	Nozaki et al.	11-1981
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5,643,819	Tseng	7-1997
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**(10) *Grounds of Rejection***

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 103***

Claims 1-4, 7, 8 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nozaki et al. (U.S. 4,298,629).

Nozaki et al. discloses a method of forming a dielectric layer on a silicon containing structure (see FIGs. 2 and 3; col. 4, line 16 to col. 5, line 53) comprising the steps of: providing, to a silicon containing structure, a gas including nitrogen; heating the silicon containing structure to an elevated temperature greater than 700°C (800°C or higher); and striking a plasma above the silicon containing structure to cause thermal nitridation of a portion of the silicon containing structure. Nozaki et al. teaches that a nitride film having a high concentration of oxygen is formed using ammonia and a nitridation reaction tube made of quartz (see col. 2, lines 35-40 and col. 8, lines 36-41). Evidently, Nozaki et al. teaches that the reaction tube made of quartz contains oxygen. Nozaki et al. also shows wherein a gate dielectric is formed from the thermal nitridation and thermal oxidation of the silicon containing structure (see col. 9, lines 3-12)

Re claim 1, Nozaki et al. fails to specifically show the nitrogen gas also include oxygen or wherein plasma stricken above the silicon containing structure also causes thermal oxidation of a portion of the silicon containing structure. However, since oxygen is present in the quartz tube, it would have been obvious to one having an ordinary skill in the art at the time the invention was made that the oxygen from the quartz tube would combine with the nitrogen gas resulting in a gas comprising a mixture of nitrogen and oxygen. Furthermore, since the general conditions of Nozaki et al. are similar to that of the instant invention, it would have been obvious

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to one having an ordinary skill in the art at the time the invention was made that the portion of the silicon containing structure that was thermally nitrided would have been thermally oxidized.

Re claims 7, 8 and 13, Nozaki et al. fails to show wherein a top structure is formed over the thermally nitrided/oxidized silicon containing structure, wherein the top structure is a gate structure. It would have been obvious to one of ordinary skill in the art at the time the invention was made that since the thermally nitrided/oxidized portion of the silicon containing structure was formed as a gate dielectric, there would be reasonable expectation from one of ordinary skill in the art that a gate structure would have been formed over the previously formed thermally nitrided/oxidized portion of the silicon containing structure. Furthermore, the specification contains no disclosure of either the critical nature of the claimed structures or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen structure or upon another variable recited in a claim, the applicant must show that the particular limitations are critical.

Claims 5, 7, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nozaki et al. (U.S. 4,298,629) in view of Tseng (U.S. 5,643,819), as previously applied in the office action mailed November 17, 1999.

Nozaki et al. discloses a method of forming a dielectric layer on a silicon containing structure previously as described, which method is repeated herein.

Re claims 5, 7, 9 and 10, Nozaki et al. fails to show wherein the silicon-containing structure is a bottom electrode of a storage capacitor of a memory device and the nitrided/oxidized portion of the silicon-containing structure is a capacitor dielectric and forming a top structure over the capacitor dielectric. Tseng teaches that a dielectric layer containing

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silicon nitride and silicon oxide maybe formed over a bottom electrode of a storage capacitor of a memory device wherein the bottom electrode is made of silicon containing material. Tseng also teaches wherein a top structure is formed over the dielectric (see col. 8, lines 15-19). It would have been obvious to one having an ordinary skill in the art at the time the invention was made to form the thermally nitrided and oxidized silicon containing material of Nozaki et al. such that it was a capacitor dielectric between a bottom electrode of a storage capacitor of a memory device and a top structure as in Tseng since, as evidenced by Tseng, silicon containing bottom structures formed as bottom electrodes for storage capacitors with dielectric layers formed of silicon nitride overlying them is well known in the art. Furthermore, the specification contains no disclosure of either the critical nature of the claimed structures or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen structure or upon another variable recited in a claim, the applicant must show that the particular limitations are critical.

**(11) Response to Argument**

Regarding Appellant's arguments that "the Examiner's deduction that oxygen is "naturally" present in the nitrogen-containing gas used in the method of the Nozaki et al. reference" and that "the thermally nitrided portion of the silicon-containing structure would also have been thermally oxidized", the Examiner does not disagree. But, as noted in the rejection above and admitted by Appellant, Nozaki et al. teaches the use of a nitrogen-containing gas along with a quartz tube that contains oxygen. Inherently, the oxygen from the quartz tube would incorporate with the nitrogen-containing gas resulting in a gas comprising a mixture of nitrogen and oxygen. As a result, thermal nitridation and thermal oxidation of the underlying structure would occur upon subsequent heating of the silicon-containing structure in the gas

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mixture of nitrogen and oxygen to an elevated temperature. The supporting fact for the previous statement can be found on page 300, lines 6-9 of the text book, *Silicon Processing for the VLSI Era*, Volume 1 - Process Technology, Second Edition. According to Wolf et al., the authors of the book, the so called "nitrided oxide" or "oxynitride" grown from such a gas mixture tends to exhibit a more uniform nitrogen distribution within the oxide. Therefore, Appellant's argument is wholly without merit because each feature is clearly present in Nozaki et al.

Appellant also argues that Nozaki et al. fails to list oxygen "as one of the available gases, and oxygen is not a constituent of any of these gases". The Examiner respectfully but specifically disagrees. As indicated above and admitted by Appellant, oxygen is present in the reaction tube made of quartz and that the oxygen would, unintentionally, incorporate with the nitrogen-containing gas source resulting in a gas comprising a mixture of nitrogen and oxygen. Furthermore, the Examiner will not argue the few lines to which Appellant has referred with regard to the purity of the nitrogen-containing gas since such a feature is not at issue because it is not necessarily claimed.

Appellant further argues that the combined teachings of the Nozaki et al. and Tseng references fall short of the requirements of claims 1, 7 and 13. The Examiner respectfully disagrees for the following reasons. As indicated above, Nozaki et al. provides the *express* suggestion to form a nitrided oxide dielectric layer from a gas mixture of nitrogen and oxygen. In addition, Tseng provides the *express* suggestion that such a dielectric layer can be formed over a bottom electrode of a storage capacitor of a memory device, and that a top structure can be formed over the dielectric layer. Given the teachings of Nozaki et al. and Tseng, one of ordinary skill in the art is amply provided with an express suggestion to form a nitrided oxide dielectric

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layer over a bottom electrode of a storage capacitor of a memory device, and to form a top structure over the dielectric layer.

For the above reasons, it is believed that the rejections should be sustained.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,



Khanh Duong  
January 28, 2002

NOTE: An appeal conference was held on January 25, 2002 with the following conferees:



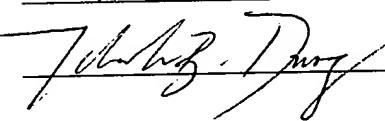
Carl Whitehead, Jr., SPE, GAU 2822

Date: 1/28/2002



Wael Fahmy, SPE, GAU 2823

Date: 1/28/2002



Khanh Duong, Examiner, GAU 2822

Date: 1/28/02

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